VIDEO HARDWARE GETS SMART

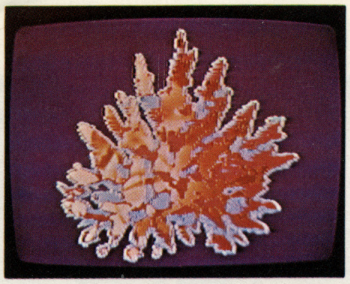
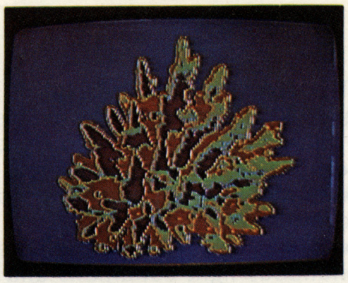
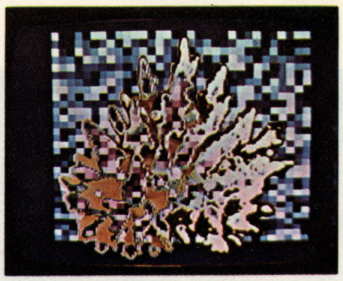
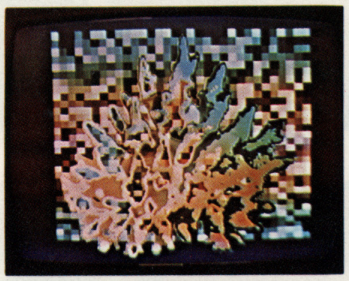
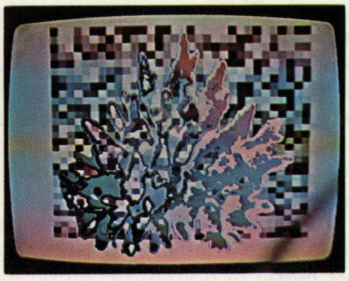
Bill Etra has combined video and computer technologies in an SEG that can control the entire teleproduction process

by Peter Caranicas

Imagine a special-effects generator that's also a video switcher, an image manipulator, a colorizer and a hybrid analog-digital computer for video. Imagine that it can perform a full range of special effects, do infinite-reentry video-switching under computer control and be used by a single operator as a control center for automatic preprogramming of an entire tv production, including remote control of the cameras, integration of lighting changes, actor cueing, prompter-device coordination—all without the necessity for cameramen, audio engineers, lighting directors and tv directors.

Such are the claims of the Intelligent Video System (IVS), a device combining many recent refinements in video and computer science, which leapfrogs the complex technology of existing television switching equipment. The majority of today's production switchers are based on technical advances built up piecemeal over the years, with each step forward simply added on to existing systems. IVS is an attempt to wipe the video-switcher slate clean and to include all the traditional switching functions, as well as some new ones, in a state-of-the-art system.

Some would describe IVS as a video synthesizer, although it cannot twist


Left and below: Etra experimenting at home

and decompose images and parts of images in the manner of a raster-scan synthesizer. It does process images, however, by changing their shapes and colors.

IVS is the brainchild of Bill Etra who, together with Steve Rutt, developed the Rutt-Etra video synthesizer, a raster-scan machine now used by several tv post-production facilities. Etra is presently assistant professor of fine arts at the University of Maryland, and divides his time between teaching there and experimenting at his loft in New York City. His main interest is video as a compositional tool—or video art—and he recently received a $13,000 grant from the National Endowment for the Arts and Humanities and the New York State Council on the Arts for research in that area.

Etra conceptualized IVS while exploring new ways of creating software and spent 2½ years developing it. But, although IVS was originally invented as an aid for video artists, it turned out to have important applications in bread-and-butter teleproduction work.

The heart of IVS is described as a matrix switcher that can switch faster than the resolution of a tv picture. A logic pulse turns on any points of the matrix to which it is addressed. A ramp control voltage fades up the matrix switcher. Two keywipe generators wipe a key to any shape in the matrix. Because the system's user deals with a matrix rather than a traditional downstream switcher, IVS allows results to be reentered at any matrix point for further processing. The matrix switcher is accompanied by a four-level key colorizer which, when used in combination with the matrix, permits levels of colorization that are virtually infinite.

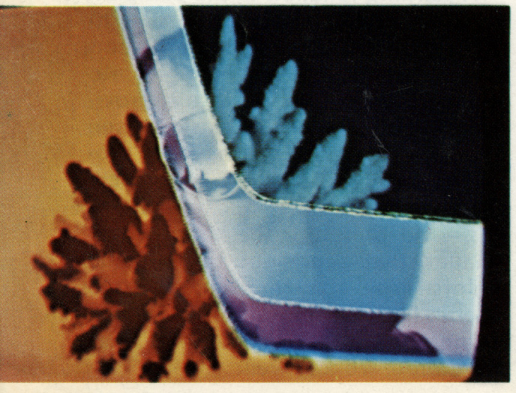
In its simplest form IVS can do multilevel keys, fades, dissolves, digital and analog outlinings, hard- and soft-edge colorizing, additive and nonadditive mixing wipe shapes, and so forth. Options include wave-form generation for more complex wipe shapes, coded chroma-key edge sharpening and an adaptor box to interface it with various audio synthesizers. Because its construction is modular, its options can be extended without making any parts obsolete.

Using still video images of coral and woman's face, IVS can produce effects such as (top, l to r) color key of coral with face inserted at level 4, key of coral with different color inserted at each level, and with computer matrix brought back in negative at level 2; and (above, l to r) a quantization of the coral with computer matrix filling level 1 and the face inserted into the highest level, a color negative of the same, and both the face and the computer matrix in negative at different levels.

IVS can be programmed with calculator-pad pushbuttons, which are used to insert whole sections of memory into the computer, and then commanded with a typewriter keyboard in relatively simple English: "Wipe; dissolve camera 3." By incorporating specific control boards, other extensions can be added to IVS, including servo controllers for remote camera units. A manual override panel will be available, however, to enable manual control of complicated sequences.

For postproduction work, part of the IVS system is an infinite positioner that can change the position of a prerecorded video picture and approximate any lost background or light level by sampling a reference selected by the operator using the manual override. In this way he or she can correct framing errors, leave the desired parts of a picture sharp and soften a scene's unwanted details.

A startling function of the completed IVS system will be its ability to translate videotape and film programs originally shot in black-and-white into color—a color that is a close approximation of the color that existed when the film or tape was originally produced, and which was lost. The process is a complex one because lighting—and therefore the various gray shades that represent the original colors—may change from scene to scene. For that reason no process of standard gray-level colorizing has heretofore worked well.



Above: image produced by using a soft-edged diamond to highlight a monochrome face over colorized coral. Below (top to bottom): face used to cut key for colorizer with coral video in layer 4; same, but with outline of coral in hue of layer 4; colorizer used for wipe function with images inserted in different layers.

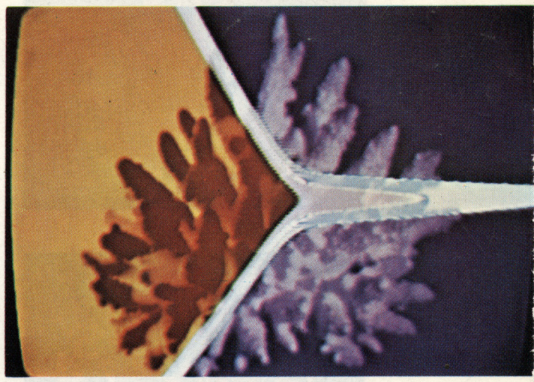
The IVS computer-colorizer is designed to circumvent these problems by allowing the hand-colorizing of specific frame areas, which can be "painted" by using a light pen on a monitor screen. The first frame of any scene—which in this context means continuous light conditions and absence of any movement—is hand-colored. The computer then locks onto the gray-scale balance of the frame, continuing to colorize sequential frames until it detects a change in the gray scale. It then stops the tape or film, automatically back-spaces to the appropriate frame, and the process is repeated.

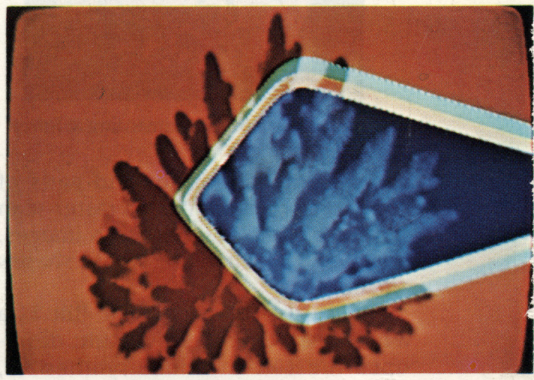
In scenes with definable background and characters, a more complex mode of operation can be used: people can be separated from the background by brightness, distinguished separately, and automatically tracked from frame to frame until the conditions no longer exist. The degree of automation with which this can be accomplished depends entirely on the amount of computer power dedicated to pattern-recognition. Perhaps when the age of consumer video finally dawns, colorized versions of Charlie Chaplin and D.W. Griffith will be made available.

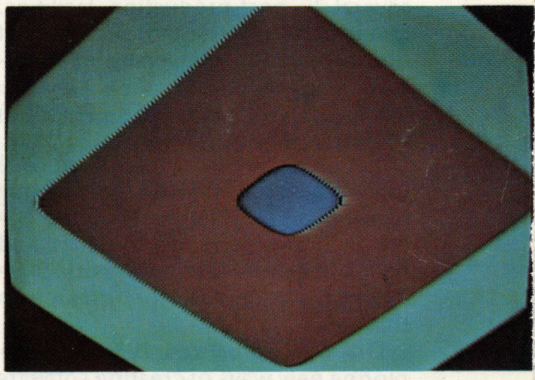
The IVS system will be marketed by Intelligent Video Systems Corp., a company to be set up by Visiondisc, Inc., a videodisc software concern. The basic core of the system will be priced at $8,500 or less. Adding computer features and the manual override will bring the price up to the $50,000 range.

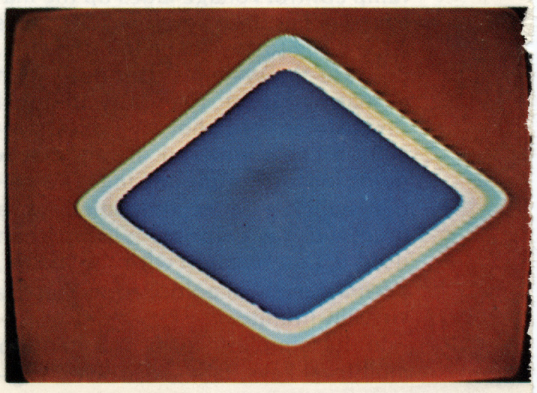
These costs are based upon relatively modest production runs. They will, nevertheless, entail extensive marketing efforts. To this end, Visiondisc is approaching major broadcast equipment manufacturers and distributors. The main target would not necessarily be broadcasters but would extend to the world of educational and industrial television as well as to experimental video groups.

IVS's backers claim that the era of eyeball-judged video is set to supplant the era of instrument-judged video, making the system acceptable for all but the highest end of teleproduction. Its major advantage will be its ability to cut down on maintenance and personnel costs. If part of the system malfunctions, all that will be required to make the correction will be the replacement of a board. More important, a single director is all that's needed to program the computer controlling the cameras, lenses and lights. If IVS lives up to its promise, complex teleproduction and special effects will come within the reach of many groups who cannot afford them today.









Above (top to bottom): colorizer used again for wipe function with images inserted in different layers; special wipe shape; colorizer used as shape generator with low chrominance in layer 3 and low luminance in layer 1. Below: wipe into colorizer, color inserted without video. All photos: computer work by Lou Katz.